

REMARKS

Elected claims 20-34 are pending for further prosecution. Non-elected method claims 1, 2 and 17-19 remain in the application, as withdrawn, for the possibility of rejoinder. Arguments for the patentability of the elected claims over the prior art of record are presented. For the reasons set forth below, Applicants respectfully submit that the present application is in condition for allowance.

I. Claim Rejections - 35 USC §102(b)/ §103(a)

- A. *In the FINAL Office Action dated April 28, 2009, claims 20-34 are rejected under 35 USC §102(b) as being anticipated by JP 05-262523 A or, in the alternative, are rejected under 35 USC §103(a) as being obvious in view of JP 05-262523 A.*

In the FINAL Office Action, it is stated that “JP ‘523 discloses a high-purity copper sulfate produced by a process wherein a high purity is achieved, which would correspond to low impurity input.” In addition, it is stated that “In the event any differences can be shown ... such differences would have been obvious to one of ordinary skill in the art”. Applicants respectfully disagree and request reconsideration and removal of the §102(b)/§103(a) rejection.

With respect to the rejection based on §102(b), it is well settled law that a claim of a patent application can be properly anticipated under 35 USC §102 only if each and every element is found described in a single prior art reference. The identical invention must be shown in as complete detail as contained in the claim, and the elements identified by the reference must be arranged as required by the claim. If a prior art reference relied on in a rejection made under 35 USC §102 does not contain every element recited in the claim in as complete detail as is contained in the claim and arranged as recited in the claim, the anticipation rejection is improper and should be removed.

Applicants respectfully submit that the disclosure of “high purity” copper sulfate of JP ‘523 fails to disclose the level of purity required by the claims of the present application and thus fails to disclose the invention in as complete detail as contained in the claims as required for a rejection under §102(b). Accordingly, Applicants respectfully submit that the product required by the claims of the present application is different than that disclosed by JP ‘523 and respectfully submit that JP ‘523 clearly fails to disclose copper sulfate having a purity of 99.99% or higher. In addition, Applicants respectfully submit that it is apparent from the disclosure provided by JP ‘523 that it is not possible to produce copper sulfate having purity as high as 99.99% from the teachings of JP ‘523. The reasons for this are discussed below.

The stated object to be achieved by the invention of JP ‘523 is as follows: “To provide a method of producing, at low cost and in a short time, a copper sulfate solution directly from metallic copper powder without going through copper oxide powder” (excerpt from original text of JP publication – Paragraph No. 0004). For purposes of achieving this object, JP ‘523 performs the following process steps: “While introducing large amounts of fine air bubbles in the suspension of metallic copper powder, sulfuric acid is added while maintaining the solution between 65°C and 85°C, and metallic copper is oxidized and melted” (excerpt from original text of JP publication - Paragraph No. 0005).

In addition, the description of the Example (Experiment No. 1) in JP ‘523 is as follows:

“920L of **industrial water** was placed in a melting unit comprising a bath with a jacket having a volume of 1.5m³ and an air type agitator, 125Kg of metallic copper powder having a grain size of 40 mesh to 60 mesh was placed therein and suspended, rotation of the agitator was set to 125rpm, and 225Kg of 98% concentrated sulfuric acid was added over a period of approximately one hour. The liquid temperature was maintained at 70°C during this period. Agitation was continued for an additional two hours. The inversion rate to copper sulfate was 99.2%.” (Excerpt from original text of JP publication – Paragraph No. 0013)

Moreover, “Experiment No. 2” of JP ‘523 is described as follows: “Metallic copper powder was placed in a solution containing 18g/L of arsenic, 30g/L of copper, and 90g/L of sulfuric acid and suspended” (excerpt from original text of JP publication – Paragraph No. 0014).

It is clear that JP ‘523 does not in any way disclose or describe the purity of the copper sulfate.

In light of the above, since the invention of JP ‘523 requires the step of “air blowing” to oxidize and melt the metallic copper, air dust (impurities) clearly will become mixed into the suspension. Moreover, in “Experiment No. 1” of the Examples of JP ‘523, industrial water is used as the suspension, and it is evident that no consideration is given to the purity of the “industrial” water. Still further, since “Experiment No. 2” uses arsenic, the inclusion of arsenic as an impurity is clearly unavoidable.

From the foregoing facts, Applicants respectfully submit that not only does JP ‘523 fail to disclose copper sulfate having a purity of 99.99% or higher, it is apparent that it is simply not possible to produce copper sulfate having a purity of 99.99% or higher from the teachings of JP ‘523. Thus, removal of the novelty/anticipation rejection under §102(b) of the claims of the present invention on the disclosure of JP ‘523 is respectfully requested. Clearly, the product claimed by the claims of the present application is different than that disclosed by JP ‘523.

With respect to the rejection based on §103(a), Applicants respectfully submit that since it would not be possible for one of ordinary skill in the art to produce copper sulfate having a purity of 99.99% or higher from the teachings of JP ‘523, the claims of the present application are patentable and non-obvious relative to the disclosure of JP ‘523. Further, the criticality of the limitations recited by the claims of the present application, for instance claims 26-34, is neither taught nor rendered obvious to one of ordinary skill in the art by JP ‘523.

For example, the present invention is directed to a plating solution for manufacturing electronic components, such as semiconductor devices. Page 6, lines 21-24, of the present application, as filed, states that “the content of Ag, Cl in the high purity copper sulfate is 1wtppm or less, respectively ... because when copper sulfate is to be used as the plating solution, Ag, Cl will have an adverse effect on the plating, and will be concentrated in the film.” Likewise, the critical nature of the alkali metals and alkaline earth metal impurities is discussed on page 6, lines 25-30, of the present application which states that “the content of alkali metals such as Na, K and alkaline earth metals such as Ca, Mg in the high purity copper sulfate is 1wtppm or less, respectively ... because when copper sulfate is to be used as the plating solution in the manufacturing method of a semiconductor device, it is easily engulfed in the plating coating, and will have an adverse effect on the performance of the semiconductor.” Still further, page 7, lines 1-3, of the present application states that “the amount of Si (containing oxide and based on Si conversion) in the high purity copper sulfate is 10wtppm or less ... because it will become foreign matter in the plating solution.”

In addition, it should be understood that semiconductor devices are continually being miniaturized and as the wiring and circuits become smaller, the presence of impurities, even at low levels, becomes a problem and causes such semiconductor devices to be defective. Thus, the present invention advances the state of the art with respect to electrolytic solutions for semiconductor manufacture.

Accordingly, Applicants respectfully submit that the limitations of the claims of the present application are critical and are not taught, suggested or disclosed to one of ordinary skill in the art by JP ‘523. Thus, Applicants respectfully submit that the claims are not obvious in view of JP ‘523 and that the §103(a) rejection of the claims should be removed.

For these reasons, Applicants respectfully request reconsideration and removal of the 35 USC §102(b) and §103(a) rejections of claims 20-34 as being anticipated by, or obvious over, JP ‘523.

B. In the FINAL Office Action dated April 28, 2009, claims 20-34 are rejected under 35 USC §102(b) as being anticipated by JP 47-040634 A or, in the alternative, are rejected under 35 USC §103(a) as being obvious in view of JP 47-040634 A.

In the FINAL Office Action, it is stated that “JP ‘634 discloses a high-purity copper sulfate produced by a process wherein a high purity is achieved, which would correspond to low impurity input.” In addition, it is stated that “In the event any differences can be shown ... such differences would have been obvious to one of ordinary skill in the art”. Applicants respectfully disagree and request reconsideration and removal of the rejection.

As discussed in greater detail below, JP ‘634 discloses a copper sulfate having a purity of 99.3%. See column 4, line 28, of the Japanese language publication of JP ‘634.

Thus, with respect to the rejection based on §102(b), it is well settled law that a claim of a patent application can be properly anticipated under 35 USC §102 only if each and every element is found described in a single prior art reference. The identical invention must be shown in as complete detail as contained in the claim, and the elements identified by the reference must be arranged as required by the claim. If a prior art reference relied on in a rejection made under 35 USC §102 does not contain every element recited in the claim in as complete detail as is contained in the claim and arranged as recited in the claim, the anticipation rejection is improper and should be removed.

Applicants respectfully submit that the disclosure of 99.3% purity of JP ‘634 fails to disclose the level of purity required by the claims of the present application and thus fails to

disclose the invention in as complete detail as contained in the claims as required for a rejection under §102(b). Accordingly, Applicants respectfully submit that the product required by the claims of the present application is different than that disclosed by JP '634 and that JP '634 clearly fails to disclose copper sulfate having a purity of 99.99% or higher. In addition, Applicants respectfully submit that it is apparent from the disclosure provided by JP '634 that it is not possible to produce copper sulfate having a purity of 99.99% or higher from the teachings of JP '634. The reasons for this are discussed below.

JP '634 provides the following disclosure: "The present inventors focused attention on the fact that it is possible to sulfate the copper content in the copper sulfide ore nearly completely by fluidizing and roasting the copper sulfide ore, and thereby conducted research for a method of economically producing copper sulfate by extracting copper sulfate from the copper sulfide ore that was subject to sulfation and roasting" (excerpt from original text of JP publication).

Moreover, as the production method of copper sulfate, JP '634 provides the following description: "A method of producing copper sulfate, comprising: (1) a first step of sulfating and roasting copper sulfide ore, (2) a second step of extracting copper sulfate under calcination as a copper sulfate tetraamine solution with a diluted aqueous ammonia and separating it from residue, (3) a third step of increasing the ammonia concentration in the obtained extraction liquid to precipitate crystals of copper sulfate tetraamine and separating them from the mother liquid, and (4) a fourth step of heating the obtained crystals to 400 to 800°C to obtain anhydrous copper sulfate" (excerpt from original text of JP publication). In addition, the Example disclosed by JP '634 is described as follows: "The anhydrous copper sulfate contains 39.5% of copper, and corresponds to a purity of 99.3% as the copper sulfate" (excerpt from original text of JP publication). (See column 4, line 28, of the Japanese language publication).

Accordingly, the purity disclosed as being achievable in the invention of JP '634 is 99.3%. In addition, JP '634 provides no technical justification of being able to achieve a purity of 99.99%.

Moreover, the intended usage of copper sulfate prepared by JP '634 as disclosed by JP '634 is as follows: "agricultural chemical (Bordeaux mixture), antiseptic agent (railroad crosstie, utility pole) starch for spinning, fishing net), Bemberg rayon, iodine production, ceramic material, pigment" (excerpt from original text of JP publication). Thus, JP '634 clearly provides a different teaching with respect to purity as evident from the intended usage of the copper sulfate, for example, in comparison to the present invention which aims to improve the plating characteristics of a microstructure semiconductor device (which is clearly not taught, suggested or disclosed by JP '634).

From the foregoing facts, Applicants respectfully submit that not only does JP '634 fail to disclose copper sulfate having a purity of 99.99% or higher, it is apparent that it is simply not possible to produce copper sulfate having a purity of 99.99% or higher. Thus, removal of the novelty/anticipation rejection under §102(b) of the claims of the present invention on the disclosure of JP '634 is respectfully requested. Clearly, the product claimed by the claims of the present application is different than that disclosed by JP '634.

With respect to the rejection based on §103(a), Applicants respectfully submit that since it would not be possible for one of ordinary skill in the art to produce copper sulfate having a purity of 99.99% or higher from the teachings of JP '634, the claims of the present application are patentable and non-obvious relative to the disclosure of JP '634.

Further, the criticality of the limitations recited by the claims of the present application, such as claims 26-34, is not taught to one of ordinary skill in the art by JP '634. For example, the present invention is directed to a plating solution for manufacturing electronic components,

such as semiconductor devices. Page 6, lines 21-24, of the present application, as filed, states that “the content of Ag, Cl in the high purity copper sulfate is 1wtppm or less, respectively ... because when copper sulfate is to be used as the plating solution, Ag, Cl will have an adverse effect on the plating, and will be concentrated in the film.” Likewise, the critical nature of the alkali metals and alkaline earth metal impurities is discussed on page 6, lines 25-30, of the present application which states that “the content of alkali metals such as Na, K and alkaline earth metals such as Ca, Mg in the high purity copper sulfate is 1wtppm or less, respectively ... because when copper sulfate is to be used as the plating solution in the manufacturing method of a semiconductor device, it is easily engulfed in the plating coating, and will have an adverse effect on the performance of the semiconductor.” Still further, page 7, lines 1-3, of the present application states that “the amount of Si (containing oxide and based on Si conversion) in the high purity copper sulfate is 10wtppm or less ... because it will become foreign matter in the plating solution.”

In addition, it should be understood that semiconductor devices are continually being miniaturized and as the wiring and circuits become smaller, the presence of impurities, even at low levels, becomes a problem and causes such semiconductor devices to be defective. Thus, the present invention advances the state of the art with respect to electrolytic solutions for semiconductor manufacture. JP ‘634 provides no recognition of the problems or solutions with respect to a copper sulfate plating solution.

Accordingly, Applicants respectfully submit that the claim limitations of the present application are critical and are not taught, suggested or disclosed to one of ordinary skill in the art by JP ‘634. Thus, Applicants respectfully submit that the claims are not obvious in view of JP ‘634 and that the §103(a) rejection of the claims should be removed.

For these reasons, Applicants respectfully request reconsideration and removal of the 35 USC §102(b) and §103(a) rejections of claims 20-34 as being anticipated by or obvious over JP '634.

- C. *In the FINAL Office Action dated April 28, 2009, claims 20-34 are rejected under 35 USC §102(b) as being anticipated by U.S. Patent No. 5,059,403 issued to Chen or, in the alternative, are rejected under 35 USC §103(a) as being obvious in view of U.S. Patent No. 5,059,403 issued to Chen.*

In the FINAL Office Action, it is stated that “Chen discloses a copper sulfate having a purity of greater than 99.8%.”

Applicants respectfully submit that Chen describes a lower limit of the purity of copper sulfate of 99.8%. For instance, see column 5, line 44, and column 6, Table 2, of Chen which recite the expression of a “purity >99.8%”. The upper limit of this expression of purity is unclear and unstated. The upper limit is not described anywhere in the specification including the Examples.

Accordingly, a problem with the disclosure provided by Chen is that the lower limit of the purity range is disclosed but the upper limit is not disclosed to one of ordinary skill in the art. That is, though it is possible for a person skilled in the art to estimate that the lower limit of the purity range is or around 99.8%, it is not possible to estimate that the upper limit can be as high as 99.99%. There is simply no evidence and no definite proof provided by Chen that purity this high could be obtained.

Accordingly, Applicants respectfully submit that it is an error to assume that 99.99% is included in the purity range disclosed by Chen.

Moreover, there are other factors that will deteriorate the purity range achievable by Chen. The purification technology of Chen is characterized in collecting copper as copper

sulfate from waste liquid with numerous impurities. In addition, since a product obtained by neutralizing the copper sulfate solution with sodium hydroxide is added once again, there is no recognition of eliminating Na as an impurity. In addition, since Chen does not perform the treatment of eliminating the early precipitation crystals as with the present invention, in the least, the impurities that should be eliminated by the foregoing treatment (treatment of eliminating the early precipitation crystals) will remain. Accordingly, it is impossible for one of ordinary skill in the art to assume that Chen is able to achieve the same level of purity as the present invention.

With respect to the rejection based on §102(b), it is well settled law that a claim of a patent application can be properly anticipated under 35 USC §102 only if each and every element is found described in a single prior art reference. The identical invention must be shown in as complete detail as contained in the claim, and the elements identified by the reference must be arranged as required by the claim. If a prior art reference relied on in a rejection made under 35 USC §102 does not contain every element recited in the claim in as complete detail as is contained in the claim and arranged as recited in the claim, the anticipation rejection is improper and should be removed.

Applicants respectfully submit that the disclosure of Chen fails to disclose any of the limitations stated in claims 25-34 and fails to disclose an upper limit of purity required by the claims of the present application. Thus, Chen fails to disclose the invention in as complete detail as contained in the claims as required for a rejection under §102(b). Accordingly, Applicants respectfully submit that the product required by the claims of the present application is different than that disclosed by Chen. Thus, removal of the novelty/anticipation rejection under §102(b) of the claims of the present invention on the disclosure of Chen is respectfully requested.

With respect to the rejection based on §103(a), Applicants respectfully submit that it would not be possible for one of ordinary skill in the art to produce copper sulfate having a

purity of 99.99% or higher from the teachings of Chen. In addition, Chen fails to disclose the critical nature of reducing certain types of impurities.

For example, the present invention is directed to a plating solution for manufacturing electronic components, such as semiconductor devices. Page 6, lines 21-24, of the present application, as filed, states that “the content of Ag, Cl in the high purity copper sulfate is 1wtppm or less, respectively ... because when copper sulfate is to be used as the plating solution, Ag, Cl will have an adverse effect on the plating, and will be concentrated in the film.” Likewise, the critical nature of the alkali metals and alkaline earth metal impurities is discussed on page 6, lines 25-30, of the present application which states that “the content of alkali metals such as Na, K and alkaline earth metals such as Ca, Mg in the high purity copper sulfate is 1wtppm or less, respectively ... because when copper sulfate is to be used as the plating solution in the manufacturing method of a semiconductor device, it is easily engulfed in the plating coating, and will have an adverse effect on the performance of the semiconductor.” Still further, page 7, lines 1-3, of the present application states that “the amount of Si (containing oxide and based on Si conversion) in the high purity copper sulfate is 10wtppm or less ... because it will become foreign matter in the plating solution.”

In addition, it should be understood that semiconductor devices are continually being miniaturized and as the wiring and circuits become smaller, the presence of impurities such as Na, even at low levels, becomes a problem and causes such semiconductor devices to be defective. Thus, the present invention advances the state of the art with respect to electrolytic solutions for semiconductor manufacture.

Accordingly, Applicants respectfully submit that the claim limitations of the claims of the present application are critical and are not taught, suggested or disclosed to one of ordinary skill

in the art by Chen. Thus, Applicants respectfully submit that the claims are not obvious in view of Chen and that the §103(a) rejection of the claims should be removed.

For these reasons, Applicants respectfully request reconsideration and removal of the 35 USC §102(b) and §103(a) rejections of claims 20-34 as being anticipated by or obvious over Chen.

II. Conclusion

In view of the above remarks, Applicants respectfully submit that the claim rejections have been overcome and that the present application is in condition for allowance. Thus, a favorable action on the merits is therefore requested.

Please charge any deficiency or credit any overpayment for entering this Amendment to our deposit account no. 08-3040.

Respectfully submitted,
Howson & Howson LLP
Attorneys for Applicants

By /William Bak/
William Bak
Reg. No. 37,277
501 Office Center Drive
Suite 210
Fort Washington, PA 19034
(215) 540-9216